CHAPTER 3

DEVELOPMENT AND EVALUATION OF ALTERNATIVES FOR CSO CONTROL

This chapter provides guidance on the development and evaluation of alternatives for long-term control of combined sewer overflows (CSOs). The information presented includes the following:

- The role of public participation and the need to coordinate with the National Pollutant Discharge Elimination System (NPDES) permitting and State water quality standards (WQS) authorities
- An overview of general approaches for developing the long-term control plan (LTCP), including the demonstration and presumption approaches for showing compliance with CWA requirements, as well as small system considerations
- Specific approaches to and aspects of developing alternatives, including definition of CSO control goals, identification of control measures, sizing, cost, and siting issues
- Approaches for evaluating alternatives, including cost/performance evaluations, non-monetary factors, and financial capability.

The chapter concludes with two case studies.

3.1 PUBLIC PARTICIPATION AND AGENCY INTERACTION

It is important to develop and maintain avenues for public involvement throughout LTCP development. Opportunities for public involvement in the assessment of existing conditions and the development of system monitoring information were presented in Chapter 2. During the development and evaluation of alternatives, the goal of the public participation program should be to involve citizens in the development of alternative solutions that protect the local waterways and consider the financial impacts to the community as a whole.

During development and evaluation of CSO control alternatives, the following key information can be presented to the public as it is developed:

- Water quality goals for each receiving water segment
- CSO control goals for each receiving water segment as developed under the presumption and/or demonstration approach options
- Types of control alternatives available to meet CSO control goals
- CSO control alternatives identified to meet the control goals
- The process of evaluating and comparing various alternatives for CSO control.

These issues can be technically complex and require effort and imagination to present in a manner that will be understandable to the public. Technical jargon and complex charts and figures might be useful to and understandable by engineers but might not be clear or understandable to the lay person. Public confusion or lack of understanding can lead to skepticism, hostility, and the inability or unwillingness to participate. These reactions can be avoided by understanding the audience and taking the time to arrange and present the information in an appropriate format. A well-designed public participation program will involve the public in the decision-making process as it proceeds.

Citizen advisory committees can serve as liaisons between municipal officials, the general public, the NPDES permitting agency, and the State WQS agency. Public meetings, public hearings, workshops, and discussion panels provide effective forums to explain the alternatives and to obtain input from as many neighborhood, business, environmental, and civic organizations as possible. These meetings should be well advertised in local papers and on local radio stations. Interested parties should be encouraged not only to speak but also to provide written comment and input. The public participation program can include activities designed to educate children about the CSO program, informational material distributed through general mailing lists or inserted into monthly utility bills, and media briefings concerning specific projects or issues.

Interaction with the NPDES permitting authority and State WQS authority should continue during development and evaluation of CSO control alternatives with a sharing of the technical information noted previously. It is important to gain ongoing agency input during this phase for many reasons. Expectations for CSO control measure performance and interpretations of wet weather data are often subject to debate, due to such factors as the relative shortage of historical data and the inherent variability of wet weather flows. The community and the regulatory agency should agree on such fundamental issues early in the project to avoid costly misunderstandings later. States have also developed their own CSO strategies, which might differ from the EPA CSO Control Policy. In these cases, a municipality should ensure through agency coordination that its LTCP addresses the appropriate State and Federal policy requirements. In addition, if CSOs occur to sensitive areas, the municipality should consult with the NPDES permitting authority, as well as other appropriate State and Federal agencies, to ensure consistency with CSO Control Policy provisions regarding sensitive areas (II.C.3). Ultimately, the NPDES permitting authority should be satisfied that the municipality has studied all reasonable options in developing a list of final alternatives for evaluation and that the evaluation process incorporates all identified concerns.

3.2 LONG-TERM CONTROL PLAN APPROACH

The LTCP should provide site-specific, cost-effective CSO controls that will provide for attainment of WQS. It should provide flexibility to municipalities in recognition of the variable impacts of CSOs on water quality and the ability of different municipalities to afford varying levels of CSO control. EPA expects that the LTCP will consider a reasonable range of alternatives and varying control levels within those alternatives, using cost-effectiveness as a consideration to help guide consideration of the controls.

3.2.1 Demonstration Versus Presumption Approach

The CSO Control Policy identifies two general approaches to attainment of WQS: the demonstration approach and the presumption approach. The demonstration and presumption approaches provide municipalities with targets for CSO controls that achieve compliance with the Clean Water Act, particularly protection of designated uses. As described in Chapter 2, all

municipalities should characterize their CSSs in order to establish a baseline and provide a basis for implementing and evaluating the effectiveness of the nine minimum controls (NMC). Characterization will likely include monitoring and modeling to characterize CSO flow and pollutant loads, impacts on receiving water quality from CSO and non-CSO sources, and efficacy of CSO controls. This characterization will enable the NPDES permitting authority, in conjunction with the municipality and with input from the public and appropriate review committees, to determine whether the demonstration or presumption approach is the most suitable.

Generally, if sufficient data are available to demonstrate that the proposed plan would result in an appropriate level of CSO control, then the demonstration approach will be selected. The demonstration approach is particularly appropriate where attainment of WQS cannot be achieved through CSO control alone, due to the impacts of non-CSO sources of pollution. In such cases, an appropriate level of CSO control cannot be dictated directly by existing WQS but must be defined based on water quality data, system performance modeling, and economic factors. These factors might ultimately support the revision of existing WQS. If the data collected by a community do not provide *"...a clear picture of the level of CSO controls necessary to protect WQS"* (II.C.4.a.), the presumption approach may be considered. Use of the presumption approach is contingent, however, on the municipality presenting sufficient data to the NPDES permitting authority to allow the agency to make a reasonable judgment that WQS will probably be met with a control plan that meets one of the three presumption criteria (see Section 3.2.1.2).

The CSO Control Policy recommends flexibility in allowing a municipality to select controls that are cost-effective and tailored to local conditions. For this reason, the choice between the demonstration approach and presumption approach does not necessarily have to be made before a municipality commences work on its LTCP. In some cases, it might be prudent for a municipality to assess alternatives under both approaches. In addition, if a municipality has CSOs that occur to two different water bodies, a control plan that includes the demonstration approach for one receiving water and the presumption approach for the other may be appropriate. Because of the flexibility in selecting an approach, it is imperative that the

municipality coordinate closely with the NPDES permitting authority. Involving the public and other stakeholders will also provide a foundation for subsequent LTCP acceptance.

3.2.1.1 Demonstration Approach

Under the demonstration approach, the municipality would be required to successfully demonstrate compliance with each of the following criteria (II.C.4.b):

> *i. the planned control program is adequate to meet WQS and protect designated uses, unless WQS or uses cannot be met as a result of natural background conditions or pollution sources other than CSOs;*
>
> *ii. the CSO discharges remaining after implementation of the planned control program will not preclude the attainment of WQS or the receiving waters' designated uses or contribute to their impairment. Where WQS and designated uses are not met in part because of natural background conditions or pollution sources other than CSOs, a total maximum daily load, including a wasteload allocation, a load allocation or other means should be used to apportion pollutant loads;*
>
> *iii. the planned control program will provide the maximum pollution reduction benefits reasonably attainable; and*
>
> *iv. the planned control program is designed to allow cost-effective expansion or cost-effective retrofitting if additional controls are subsequently determined to be necessary to meet WQS or designated uses.*

Under Criterion i, the CSO Control Policy reiterates that NPDES permits must require attainment of WQS, but recognizes that in many receiving water segments, sources other than CSOs might be contributing substantially to nonattainment of WQS. In these cases, even complete elimination of CSOs might not result in attainment of WQS. Criterion ii is intended to ensure that the selected level of CSO control would be sufficient to allow attainment of WQS if other sources causing nonattainment were controlled. Criterion iii reiterates the emphasis on developing cost-effective levels of control, while Criterion iv ensures that sufficient flexibility is incorporated into the LTCP to allow upgrading to higher levels of control if necessary.

The demonstration approach encourages the development of total maximum daily loads (TMDLs) and/or the use of a watershed approach throughout the LTCP process. In conducting the existing baseline water quality assessments as part of the system characterization, for example, the specific pollutants causing nonattainment of WQS, including existing or designated uses, would be identified, and then the sources of these pollutants could be identified and loads apportioned and quantified. Assessments would be made of the relative contribution of CSOs and other sources to the total pollutant loads to the receiving waters, and then a range of controls could be identified to target the CSO contribution. Controls for the non-CSO sources of pollutants could also be assessed at the same time, depending on the overall scope of the LTCP, jurisdictional issues within the municipality, and other issues.

The statutory basis for defining the relative contributions of different sources of pollution is the CWA, under Section 303(d), which requires the identification of "water quality limited" stream segments still requiring TMDLs. These are areas where water quality does not meet applicable WQS and/or is not expected to meet applicable WQS even after the application of required controls, such as the technology-based control measures (40 CFR 131.3(h)). A TMDL is defined as the sum of the individual wasteload allocations (WLA) for point sources; load allocations (LA) for nonpoint sources of pollution and natural background sources, tributaries, or adjacent segments; and a margin of safety. The objective of the TMDL is attainment of WQS. The process uses water quality analyses to predict water quality conditions and pollutant concentrations. The establishment of a TMDL for a particular water body depends on the location of point sources, available dilution, WQS, nonpoint source contributions, background conditions, and in-stream pollutant reactions and effluent toxicity. A TMDL can be expressed in terms of chemical mass per unit time, by toxicity, or by other appropriate measures.

In cases where the natural background conditions, or pollution sources other than CSOs, are contributing to exceedances of WQS, the State is responsible for the development of a TMDL and the WLA for any CSOs. The municipality must then demonstrate compliance with the effluent limitation derived from the WLA established as part of the TMDL (EPA, 1995g). The NPDES permitting authority will also specify what constitutes a reasonable effort by the municipality to demonstrate the maximum pollution reduction benefits reasonably attainable.

The term "reasonably attainable" generally refers to the cost of implementing the planned control program in relation to the pollution reduction benefit achieved (EPA, 1995g).

3.2.1.2 Presumption Approach

The CSO Control Policy recognizes that *"...data and modeling of wet weather events often do not give a clear picture of the level of CSO controls necessary to protect WQS"* (II.C.4.a). For this reason, the presumption approach was included in the CSO Control Policy as an alternative to the demonstration approach. The presumption approach is based on the assumption that an LTCP that meets certain minimum defined performance criteria "...*would be presumed to provide an adequate level of control to meet the water quality-based requirements of the CWA, provided the permitting authority determines that such presumption is reasonable in light of the data and analysis conducted in the characterization, monitoring, and modeling of the system and the consideration of sensitive areas...*" (II.C.4.a).

Under the presumption approach, controls adopted in the LTCP should be required to meet one of the following criteria (II.C.4.a):

i. No more than an average of four overflow events per year, provided that the permitting authority may allow up to two additional overflow events per year. For the purpose of this criterion, an overflow event is one or more overflows from a CSS as the result of a precipitation event that does not receive the minimum treatment specified... [see definition of minimum treatment, below]*; or*

ii. The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis; or

iii. The elimination or removal of no less than the mass of the pollutants identified as causing water quality impairment through the sewer system characterization, monitoring, and modeling effort for the volumes that would be eliminated or captured for treatment under paragraph ii above.

The minimum level of treatment applicable to Criteria i and ii is defined in the CSO Control Policy as follows (II.C.4.a):

- *Primary clarification; removal of floatable and settleable solids may be achieved by any combination of treatment technologies or methods that are shown to be equivalent to primary clarification;*
- *Solids and floatables disposal; and*
- *Disinfection of effluent, if necessary, to meet WQS, protect designated uses and protect human health, including removal of harmful disinfection chemical residuals, where necessary.*

Use of the presumption approach does not release municipalities from the overall requirement that WQS be attained. If data collected during system characterization suggest that use of the presumption approach cannot be reasonably expected to result in attainment of WQS, the municipality should be required to use the demonstration approach instead. Furthermore, if implementation of the presumption approach does not result in attainment of WQS, additional controls beyond those already implemented might be required. This is why the CSO Policy recommends *"The selected controls should be designed to allow cost-effective expansion or cost-effective retrofitting if additional controls are subsequently determined to be necessary to meet WQS, including existing and designated uses"* (II.C).

As noted in Chapter 2, the existing baseline should be established following the system characterization. This is the point at which one of the presumption approach criteria is applied. Implementation of the NMC following system characterization could reduce the number of overflows and/or the amount of flow subject to 85-percent capture, therefore potentially reducing the costs associated with LTCP implementation.

Criterion i. The CSO Control Policy defines an overflow event under Criterion i as *"...one or more overflows from a CSS as the result of a precipitation event that does not receive the minimum treatment specified..."* (II.C.4.a.i). In a CSS with three outfalls, therefore, if one, two, or three of the outfalls discharge untreated or inadequately treated combined sewage during

a rain event, then a single overflow event has occurred. Furthermore, in terms of defining an overflow event, a "CSS" is not necessarily the entire set of combined sewers within a municipal or regional boundary. In some cases, a municipality or regional sewer authority might be considered to have more than one CSS if the systems are not hydraulically related. In such a case, the calculation of four overflow events per year would apply for each system individually and not to the entire set of combined sewers within the municipality or regional jurisdiction (this concept would apply to Criteria ii and iii, as well). In addition, the prohibition of more than four overflow events per year (with up to two more if the NPDES permitting authority approves) applies to overflows *not receiving the minimum treatment of primary clarification, solids and floatables disposal, and disinfection, if necessary*. Outfalls may overflow more frequently if they receive the minimum specified treatment.

Criterion ii. Under Criterion ii, the "*85 percent by volume of the combined sewage*" refers to 85 percent of the total volume of flow *collected* in the CSS during precipitation events on a system-wide, annual average basis (not 85 percent of the volume being discharged). In other words, no more than 15 percent of the total flow collected in the CSS during storm events should be discharged without receiving the minimum specified treatment. The total volume of flow collected during wet weather on a system-wide annual average basis would be most readily computed using a model of the CSS, such as SWMM. Similarly, the total volume of flow discharged without receiving the minimum treatment can also be computed using an annual simulation with a CSS model, such as SWMM. Comparing these two volumes under existing conditions will indicate the extent of additional controls necessary to meet the criterion for 85 percent elimination or capture. Sizing facilities to meet a performance criterion based on annual average performance, however, will probably require iterative evaluations of annual simulations. Depending on the size and complexity of the system being modeled, as well as the speed of the hardware used for the simulation, this process can require a great deal of computer time and follow-up analysis.

Analysis performed in conjunction with EPA's 1992 CSO Control Policy dialogue has shown that criteria i and ii are approximately equal. Based on regional rainfall patterns, and primary clarification provided by an appropriately designed sedimentation/storage basin, the

number of annual overflows corresponding to primary clarification of 85 percent of the combined sewage was determined. On a nationwide basis, the number of overflows not receiving primary treatment and corresponding to 85 percent capture for treatment, ranged from four to six depending on location. In practice, a CSO control facility that captures for treatment 85 percent of the combined sewage collected in the system may experience more than six overflows on an annual average basis, although a significant deviation from this range of overflows would not be expected. In cases where a significant deviation due to local conditions is encountered, the permit writer's judgment should be used to determine whether use of the 85 percent capture criterion is appropriate. Also, as previously stated, use of either of the presumption approach options should be based on reasonable assumption that implementation of controls meeting these criteria will be sufficient to prevent violations of WQS.

Criterion iii. Criterion iii, meanwhile, makes the distinction between the control of CSO volume and the control of the specific pollutants within that volume that cause water quality impairment. As noted earlier, CSS modeling could provide the total volume of flow collected during wet weather in the CSS on an annual average basis. The volume needed to be captured to meet Criterion ii would then be 85 percent of that total. Using average pollutant concentrations and removal efficiencies associated with the equivalent of primary treatment, one could compute the mass of the pollutants that would be removed if 85 percent of the wet weather flow received the equivalent of primary treatment. Comparing this value with the mass of pollutants that is currently removed during wet weather would yield the additional mass of pollutants needed to be removed to meet Criterion iii.

For example, suppose a municipality's CSS had the following characteristics, based on the system characterization:

- Total volume of combined sewage collected in the CSS on an annual average basis during wet weather—100 MG
- Total volume of combined sewage receiving secondary treatment at the municipality's POTW during wet weather—10 MG
- Pollutant causing water quality impairment in receiving water body—BOD

- Average concentration of BOD in CSO from the municipality's CSS—80 mg/l
- Wet weather BOD removal efficiency for primary clarification as determined for the municipality based on review of local POTW performance and historical data—20 percent
- Wet weather BOD removal efficiency from municipality's secondary POTW—80 percent.

The mass of BOD removed by providing the equivalent of primary clarification for 85 percent of the combined sewage collected during wet weather on an annual average basis would be computed as follows:

$$100 \text{ MG} \times 85\% \times 80 \text{ mg/l} \times 8.34 \times 20\% = 11{,}342 \text{ lbs.}$$

Since 10 MG of combined flow receives secondary treatment at the municipality's POTW during wet weather, the remaining load of BOD to be captured from CSOs to meet Criterion iii would be:

$$11{,}342 \text{ lbs} - (10 \text{ MG} \times 80 \text{ mg/l} \times 80\% \times 8.34) = 6{,}005 \text{ lbs.}$$

Criterion iii also considers pollution prevention measures. Activities such as street sweeping, litter control, and erosion control programs would reduce the load of certain pollutants carried to the receiving water, without affecting overflow volumes. Similarly, if more sophisticated modeling and monitoring programs support the use of time varying concentrations to compute pollutant loads, it might be possible to demonstrate that capture of the appropriate load of pollutants could be achieved with capture of a lower volume of flow.

The specific pollutants causing WQS nonattainment may vary from water body to water body. The pollutants of concern to a given municipality will, therefore, depend on the specific water resources affected by CSOs and their desired uses. The intent of the minimum level of treatment recommended in the presumption approach is to control floatables, pathogens, and solids. The primary impact of floatable material on receiving waters is aesthetic. Pathogens are

bacteria, protozoa, and viruses that can cause disease in humans through ingestion, inhalation, and skin contact. These potential health risks are associated with uses of receiving waters for water supplies, primary contact recreation, such as swimming; secondary contact recreation, such as boating; and with the consumption of contaminated fish and shellfish. Although not pathogenic themselves, the presence of coliform bacteria is used as an indicator of the potential presence of pathogens and of potential risk to human health. Solids can cause problems in either the suspended or deposited state and their removal is important for several reasons. Suspended solids can make the water look cloudy or turbid, diminishing the aesthetic and recreational qualities of the water body. Turbidity limits light penetration into the water column and reduces the growth of microscopic algae and submerged aquatic vegetation. Suspended solids can also impede feeding by filter-feeding organisms, such as shellfish and small aquatic invertebrates.

In addition, deposited sediments can change the physical nature of the bottom, altering hydrology and habitat and affecting navigation. Sedentary bottom-dwelling species can be smothered by accumulating sediment, and the change in habitat can preclude the continued success of many species that use the bottom habitat to feed, spawn, or live. Sediments are also a sink for adsorbed pollutants, such as nutrients (e.g., nitrogen, phosphorus), toxic metals, and organics, which can affect both water-column and bottom-dwelling organisms. These toxic pollutants can be remobilized if sediments are disturbed and can pose a health hazard to humans consuming fish and shellfish.

Defining "minimum treatment" and "primary clarification." As stated above, the minimum level of treatment applicable to Criteria i and ii of the presumption approach consists of:

- Primary clarification or equivalent;
- Solids and floatables disposal; and
- Disinfection, as necessary, and removal of disinfection residuals, as necessary.

The definition of "primary clarification" is one of the key implementation issues underlying the presumption approach and has generated considerable debate among regulators,

municipalities, consultants, and equipment suppliers. The intent of primary clarification is removal of settleable solids from the wastestream, which will result in the environmental benefits outlined above.

The CSO Control Policy does not define specific design criteria or performance criteria for primary clarification, however. This guidance document does not provide a definition either; instead, it discusses general considerations for primary clarification under the presumption approach, recognizing the variable nature of CSOs and general lack of historical data on CSO treatment facility performance. EPA recognizes the need for flexibility and urges municipalities and NPDES permitting authorities to coordinate to develop a site-specific definition of CSO primary clarification as "minimum treatment" under the presumption approach.

This definition should take the form of target ranges for design criteria (overflow rate, sidewall depth, residence time) and/or performance (removal rates), rather than a specific number or limit and should be based on several factors, including:

- Wet weather performance of primary treatment facilities at the municipality's POTW
- Historic data (e.g., literature values, existing POTW primary treatment data, existing CSO facility performance data).

The following documents provide additional information on defining primary clarification for a specific application:

- *Water and Wastewater Engineering* (Fair et al, 1968)
- *Recommended Standards for Wastewater Facilities (Ten States Standards)* (Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, 1990)
- *Wastewater Engineering: Treatment, Disposal, Reuse* (Metcalf & Eddy, Inc., 1991a)
- *Design of Municipal Wastewater Treatment Plants, WEF Manual of Practice No. 8: ASCE Manual and Report on Engineering Practice No. 76.* (WEF, 1992)

These documents describe performance and design parameters commonly associated with POTW primary treatment facilities.

In determining an equivalent of primary clarification for CSO flows, the following differences between CSO control facilities and POTWs should be considered:

- Influent hydrographs for CSO control facilities tend to exhibit more sharply defined peaks, not typical of POTW influent hydrographs, as well as periods of no flow. Therefore, the concept of "average" flow is less significant for a CSO control facility than a POTW. For example, the peak influent flow rate can occur before the sedimentation/storage tank is full; therefore, the maximum overflow rate would occur on the falling leg of the influent hydrograph, and the actual maximum overflow rate would be less than a calculated overflow rate associated with the actual peak influent flow.
- Compared to relatively constant influent pollutant concentrations at POTWs, influent pollution loads and concentrations to CSO treatment facilities can be highly variable within a single storm event and between different events.
- CSO flows generally have a higher fraction of heavier solids than separate sanitary flows.

Exhibit 3-1 illustrates how a CSO storage/sedimentation facility might perform during a rainfall event. The lower vertical axis represents the total flow rate of the combined sewage collected upstream of the storage/sedimentation facility, while the upper vertical axis indicates rainfall intensity. The horizontal dashed lines represent surface loading rates within the storage/sedimentation facility. The capacity of the CSS corresponds to the "0 gpd/ft^2" line, and thus the volume of flow above that line is diverted into the storage/sedimentation facility.

Between hours 0 and 4, the conveyance system carries the entire combined sewage volume to the POTW treatment plant. At hour 4, the capacity of the conveyance system is exceeded, and the excess flow is diverted to the storage/sedimentation facility. Between hours 4 and 7.25, the facility tanks are filling, and no overflow is discharged. At hour 7.25, the tanks are completely filled, and excess flow is discharged at an overflow rate of between 1,000 and 2,000 gpd/ft^2. Overflow rates within this range are assumed to provide at least 40 percent TSS removal, based on typical sedimentation system design criteria. Between hours 8 and 10, the overflow rate exceeds 2,500 gpd/ft^2, and the volume of overflow occurring during this period

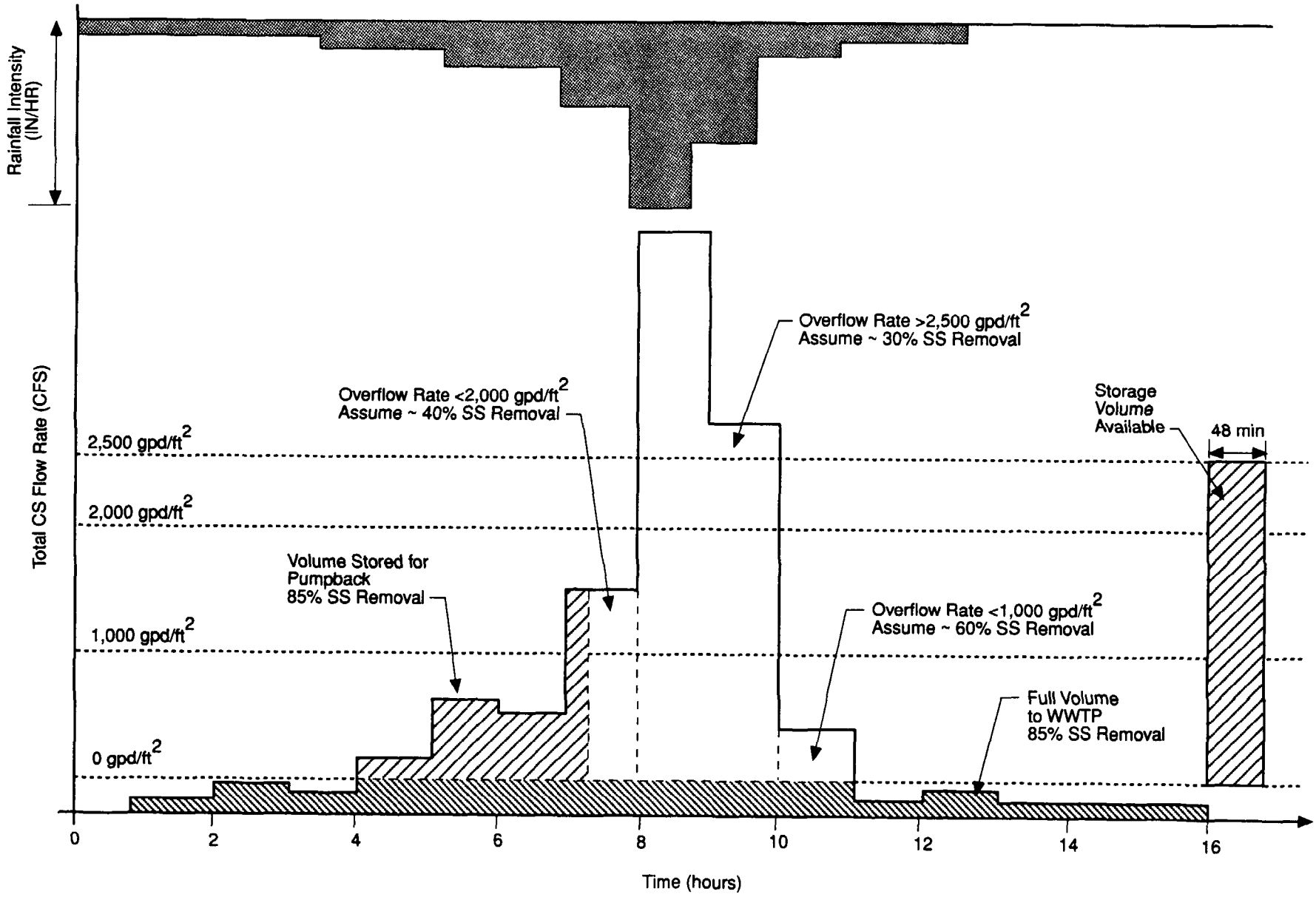

Exhibit 3-1. An Example of Overflow Rates Versus Pollutant Removal During a Rainfall Event

is assumed to receive 30 percent TSS removal. At hour 10, the overflow rate drops to less than 1,000 gpd/ft^2 as the storm begins to subside. Overflow volumes in this range are assumed to receive 60 percent TSS removal. After hour 11, flows have dropped back below the capacity of the conveyance system, and flow into the facility ceases. At hour 16, dewatering of the facility begins, thus restoring the available storage volume. The dewatered volume is assumed to be returned to the POTW for full secondary treatment, with 85 percent TSS removal.

Thus, a CSO treatment facility designed for storage and sedimentation would typically provide the following levels of control:

- Full secondary treatment (85 percent TSS and BOD_5 removal) for small rainfall events where the total CSO volume diverted to the storage/sedimentation facility is less than the volume of the storage/sedimentation basin, and all of the CSO flow is stored and directed back to the POTW. While providing secondary treatment of overflows from small storms is not specifically included as part of the presumption approach, it would be an additional benefit of using the storage/sedimentation tank technology.

- A combination of primary and secondary treatment for storms that exceed the volume of the storage/sedimentation tanks, but where the overflow rates are within the determined range for primary treatment. The flow discharged from the facility would receive the equivalent of primary treatment, while the volume of the tanks would be returned to the POTW for secondary treatment.

- Lower levels of treatment for major storm events where the peak overflow rate exceeds the design range for primary treatment. Under the presumption approach, the CSO Control Policy recommends that NPDES permitting agencies allow the exceedance of the design overflow rates four times per year or, alternatively, 15 percent of total annual combined sewage flow to be discharged without receiving the equivalent of primary treatment.

Because storage/sedimentation is only one potential CSO control alternative, the municipality and the NPDES permitting agency might also have to determine the effectiveness of other types of CSO control alternatives to meet the performance criteria of the presumption approach. This task can be challenging, given the shortage of published CSO performance data. In many cases, published data are site-specific and cannot necessarily be generalized for other locations due to differences in CSO quality and flow characteristics. For further discussions

of related CSO control technologies, refer to the *Manual on Control of CSO Discharges* (EPA, 1993a).

In summary, the municipality should consider the following points when selecting the presumption approach:

- The NPDES permitting authority must be able to judge that the system characterization data submitted by the municipality provide a reasonable assurance that WQS would be met with the presumption approach. Based on the available data, the NPDES permitting authority may disallow use of the presumption approach or may restrict the selection of the criterion (i, ii, or iii) to be adopted in the LTCP. Close coordination between the municipality and the NPDES permitting and WQS authorities is necessary at all times to ensure appropriate data development to support selection of the presumption approach.

- The NPDES permitting authority has the ultimate authority to determine the number of allowable overflow events.

- The four overflows per year criterion is only one option available to municipalities in choosing an approach to comply with the CWA. A municipality may prefer to consider the demonstration approach, or the 85 percent capture or pollutant mass options under the presumption approach where appropriate.

- Selection of the presumption approach does not relieve the municipality from the need to characterize the CSS. This characterization should provide the basis for the NPDES permitting authority to determine whether the presumption approach would likely result in attainment of WQS.

- The selected LTCP option to be included in an NPDES permit must "*...ultimately result in compliance with the requirements of the CWA*" (II.C). For this reason, if post-construction compliance monitoring indicates WQS nonattainment due to CSO impacts, a greater level of control should be required than was originally contemplated under the selected presumption approach criterion.

- The decision to choose either the presumption or the demonstration approach is important because it will affect the development of alternatives for the LTCP. It might be appropriate to evaluate a range of alternatives under both approaches so that the level of control, costs, and benefits can be compared in making a decision.

3.2.2 Small System Considerations

The CSO Control Policy acknowledges that *"...the scope of the long-term CSO control plan, including the characterization, monitoring and modeling, and evaluation of alternatives...may be difficult for some small CSSs"* (I.D). EPA recognizes that smaller communities with limited resources might benefit more than investment in CSO controls than from these aspects of LTCP development (EPA, 1995g). For this reason, at the discretion of the NPDES permitting authority, municipalities with populations of less than 75,000 need not be required to complete each of the formal steps outlined in the CSO Control Policy.

At a minimum, however, the permit requirements for developing an LTCP should include compliance with the NMC, consideration of sensitive areas, a post-construction compliance monitoring program sufficient to determine whether WQS are attained, and public participation in the selection of the CSO controls (EPA, 1995g). In developing a small system LTCP, municipalities should consult with both the NPDES permitting and WQS authorities to ensure that the plan includes enough information to allow the NPDES permitting authority to approve the proposed CSO controls.

3.3 DEVELOPMENT OF ALTERNATIVES FOR CSO CONTROL

Development of alternatives for CSO control is generally based on the following sequence of events:

1. Definition of water quality goals
2. Definition of a range of CSO control goals to meet the CSO component of the water quality goals
3. Development of alternatives to meet the CSO control goals.

Within this general context, this section is organized as follows. Section 3.3.1 presents some general considerations, primarily regarding the relationships between the LTCP and other related aspects of a municipality's collection and treatment system, including the NMC. Section 3.3.2 discusses and highlights an example of possible definitions for water quality goals and